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ABSTRACT

A change that has taken place in the methodology of teaching science--a change from teaching to impart specific information to teaching students how to process the information of their experiences--has led to questioning whether a relationship exists between selected teacher characteristics and success in teaching such a curriculum. Factors of sex, grade level taught, school district, years of teaching experience, and academic preparation in science were examined for significance. The sample of 110 elementary teachers from six school districts were participants in an inservice teacher education program prior to teaching Science-A Process Approach. Student achievement, which was used as an index of teaching success, was assessed by administering the AAS Competency Measure at the conclusion of each exercise. A minimum of six exercises was taught by each teacher. Multiple linear regression analysis showed that the variables of sex, grade level, school district, years of experience, and hours of science accounted for 45 percent of the variance in the student achievement score. Of these, sex, grade level, and years of teaching experience made significant independent contributions to predicting teacher success. (Author)

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A STUDY OF TEACHER CHARACTERISTICS AS PREDICTORS OF SUCCESSFUL IMPLEMENTATION OF AN INNOVATIVE CURRICULUM

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Much of the research on teacher effectiveness has been based on the assumption that teaching competence can be measured by over-all effectiveness of student learning. Also, it is frequently assumed that the teacher who stimulates the greatest student growth in one basic skill will stimulate the greatest growth in other skills. Mitzel (1960) states, however,

> . . . that though the evidence is fragmentary it preponderantly supports a multidivisional view of teaching effectiveness.

Barr (1945) suggests that research data indicates certain teacher qualities and actions to be prerequisite to certain outcomes and other qualities to be prerequisite to yet other outcomes. He feels there is a need for differential prediction in teacher personnel research as in pupil personnel research.

Various methods have been used to attempt to assess teacher

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success, but Barr (1935) states that the ultimate criterion of teaching success will have to be found in the changes produced in pupils as measured against the objectives of education. Erickson (1954) stated that teaching effectiveness as determined by pupil learning could be considered an index of success or as an index of effectiveness for that teacher. Mitzel (1960) also suggests that

> . . . product criteria of teaching success should consist primarily of measures of the goal-oriented effects of teachers on children obtained immediately after the periods in which children attend the schools.

Hellfritzsch's (1945) study revealed no single measure that could validly be substituted for the actual measurement of pupil growth in evaluating the ability of the teacher to teach.

Ryans (1960) has reported on the relationship between criteria and teaching success. He stated that the size of the community is likely to be positively correlated with teaching effectiveness. He also found that enrollment in particular courses and grade level taught appear to bear very little relation to success.

In a study of National Teacher Examination scores, Ryans (1941) reported that persons with extensive teaching experience did as well, and in some cases slightly better, on some of the tests than did teaching novices. Another study by Ryans (1951) determined that teaching experience is associated with effective teaching, with the 5-9 years experience group being significantly higher in effectiveness than teachers with more or less experience. No difference

was found in the school system or amount of college training in relation to teacher success.

Although these studies seem to indicate conflicting relationships between success and community, grade level taught, years of teaching experience, and enrollment in specific courses, it should be noted that the teachers involved in these studies are being judged in their effectiveness with a curriculum designed to impart information. What factors are related to teaching success in a curriculum that is designed to teach students how to think? Are the variables of the grade taught, expectations of the school district, teaching experience or academic preparation in science factors which could be predictors of success in a specific science curriculum?

PROBLEM:

The role of the teacher has changed significantly in recent years. One change has been in the methodology of teaching science - a change from teaching to impart specific information to teaching students how to process the information of their experiences.

In this new role, are there specific teachers who are more likely to have students that are successful? What is the relationship between specific characteristics of teachers and the success of their pupils?

This study is concerned with identifying what relationships exist between selected teacher characteristics and success

in teaching a specific science curriculum. Successful teaching is defined as the degree to which students learn. Therefore, student performance was used as the indicator or index of teaching success.

DESIGN:

Since 1963, teachers have been participating in the field tryout of the American Association for the Advancement of Science elementary school science materials, Science - A Process Approach (1965). In 1965, six school districts within the State of Texas were identified as cooperating pilot centers to use Science - A Process Approach. The schools involved represented a geographic cross-section of the state, and the students were from varying ethnic and socio-economic backgrounds. The 110 elementary teachers included in the study were predominately volunteers participating in an in-service teacher education program prior to teaching the science program. The number of years of teaching experience varied from 0 to 39. The mean of the years of teaching experience was 13. The teachers had taken from 0 to 60 hours in science. with Thas the mean for the sample.

INSTRUMENTATION AND ANALYSIS

To assess student achievement in the science curriculum the AAAS Competency Measure (1965) was used. The Competency Measure is an individually administered performance test consisting of a series of questions for each exercise which is designed to measure behavioral achievement of the objectives of the exercise. It was administered by the teacher at the end of each exercise to three children selected at random from the class roster. Children tested were rotated for each exercise so that a representative sample of the class was obtained. A minimum of six lessons was taught by each teacher. From these tests, the percentage of success for each class taught by a teacher was determined and the mean competency scores for each teacher's class was used in the analysis.

Biographical data on the teachers were collected from in-service records.

Using multiple linear regression analyses, the competency score was treated as the criterion to be predicted by (1) grade taught, (2) school district, (3) years of teaching experience and (4) hours in science courses.

FINDINGS:

The R^2 coefficient associated with a particular model is the squared multiple correlation of the prediction with the competency criterion score. It may be directly interpreted as the

proportion of criterion variance "explained" by the prediction information. It was found that the variables of grade level, school district, years of experience and hours of science accounted for 45% of the variance on the Competency Measure, as indicated by R^2 of the full model.

The difference between the R_F^2 and $R_{R^*}^2$ indicates the proportion of the variation of the criterion accounted for by the ommitted information, independently of all other predictor information. The results of these analyses are shown in Table I.

TABLE I

CORRELATIONS AND F-RATIOS SHOWING SIGNIFICANCE OF OMITTED INFORMATION

Restricted Model	No. of Predictors	Information omitted from full model	R_R^{2**}	$R_F^2 - R_R^2$	F	P
1.	7	Grade level	.1754	.2783	8.0637	<.001
2.	6	School district	.4400	.0137	0.4771	n.s.
3.	1	Years of teaching experience	.4283	.0252	4.3719	<.05
4.	1	Hours of science	.4508	.0029	0.5054	n.s.

**R^2 for full model = .4537, df = 95

* R_F^2 = squared multiple correlation for "full" model.

R_R^2 = squared multiple correlation for "restricted" model.

1. Grade level makes a very significant contribution to the variation in competency measure scores.

2. The number of years a teacher has taught makes a significant contribution to predicting teaching success.

Differences in regression weights indicate differences in the expected competency measure scores. The regression weights for significant items indicate the following:

1. Teachers of different grades, other variables held constant, would be expected to achieve varying levels of success. The regression weights for each grade level indicate relative expected success. (See Table II). For example, the difference between regression weights for kindergarten and sixth grade is 13.6 -1 = 12.6. This means that two teachers, one kindergarten and one sixth grade, who are the same on other variables, would be expected to differ by 12.6 points on the competency measure score with the kindergarten teacher having the higher score. Although it would appear that kindergarten teachers are more successful than other teachers, this result may only indicate differences in the difficulty of the material at different grade levels.

2. There is a positive correlation between years of experience and success in teaching the program, with the more experienced teachers having higher scores than those teachers who were less experienced.

TABLE II

A COMPARISON OF REGRESSION WEIGHTS
SHOWING DIFFERENCE IN EXPECTED
COMPETENCY MEASURE SCORES BY GRADE LEVEL.

Grade Level	Regression Weights
K	+13.6
1	+11.4
2	+ 5.8
3	- 4.3
4	- 1.5
5	+ 2.5
6	+ 1.0

DISCUSSION:

Teacher characteristics which appear to predict successful teaching of an innovative curriculum are the grade level being taught, and the number of years of teaching experience.

Teachers of different grade levels would be expected to achieve varying levels of success on the Comptency Measure. Kindergarten teachers would be expected to be the most successful with third grade teachers being the least successful. The variance in expected scores could be a reflection of the difficulty of the materials. It could also be the result of the instructional materials being in various stages of experimental development. The variance in grade level scores could be, in addition, a reflection

of the validity of the test instrument and also of its experimental nature. Teachers' previous experience with the scope and sequence of the curriculum might have had some effect on grade level results, but no data are available to test this possibility.

There is a positive correlation between number of years of experience and teaching success. It should be noted that 13 is the mean of years of teaching experience. A possibility with regard to years of experience is that more experienced teachers are more intuitive about children's though processes. As a result, they may be better able to judge what learning has taken place. It might also be noted that most of the teachers in the study were volunteers in an in-service program.

SUMMARY:

It was hypothesized that certain selected teacher characteristics are related to teaching success. Characteristics examined were (1) grade level, (2) school district, (3) number of years of teaching experience and (4) number of hours in science courses.

Multiple linear regression analyses showed that the variables of grade level, school district, years of experience, and hours of science accounted for 45% of the variance in the Competency Measure Scores. Of these,grade level, and years of teaching experience made significant independent contributions to predicting teaching success.

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